

#### UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Region 6 1445 Ross Avenue, Suite 1200 Dallas, Texas 75202 - 2733

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SURFACE WATER QUALITY BUREAU

Miguel Montoya New Mexico Environment Department Surface Water Quality Bureau 1190 South St. Francis Drive P.O. Box 5469 Santa Fe, NM 87502-5469

Dear Mr. Montoya:

The Region 6 office completed its review of the Quality Assurance Project Plan (QAPP) for the "Rapid Assessment Method for Springs in Southwestern New Mexico, CD-00F73601-C". The QAPP was approved on March 20, 2018, and will expire on March 20, 2020.

Please submit a revised/updated QAPP at least sixty (60) days prior to the expiration date. If no substantial technical or programmatic changes have occurred in the project, submit a letter stating that no changes are needed. This letter should also be submitted at least sixty (60) days prior to the expiration date.

Attached is the completed QAPP signature page for your records. In any future correspondence relating to this QAPP, please reference QTRAK #18-242. If you have any questions, feel free to contact me at (214) 665-2259.

Sincerely,

Sharon D. Daugherty

**Environmental Protection Specialist** 

State/Tribal Program Section

Enclosure

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SURFACE WATERS

# **Rapid Assessment Method for Springs in Southwestern New Mexico**

CWA Section 104(b)(3) Wetlands Development Grant CD# 00F736-01-0C (FY2014)

# **Quality Assurance Project Plan**

Submitted by: New Mexico Environment Department Surface Water Quality Bureau

**A PROJECT MANAGEMENT** 

**A1 Title and Approval Sheet** 

Magne Magne	_Date: <u>3/15</u> -/2018
Maryann McGraw	
Wetlands Program Coordinator, SWQB	
Mguel Montoya Quality Assurance Officer, SWQB	_Date: <u>3/1</u> 8/18
Abraham Franklin	Date: 3/15/18
Program Manager, SWQB Watershed Protection	n Section
Sharon Daugherty	Date: 3/20/18
Project Officer, WQPD, EPA Region 6	
My A Era Region &	_Date: 3/20/18
Curry Jourges (/	/ /
Chief, State and Tribal Programs Section, WQP	D, EPA Region 6

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A2 Table of Contents	
A Project Management	1
A1 Title and Approval Sheet	1
A2 Table of Contents	3
A3 Distribution List	6
A3.1 New Mexico Environment Department Surface Water Quality But (SWQB)	
A3.2 Springs Stewardship Institute ("Contractor")	6
A3.3 U.S. Environmental Protection Agency Region 6	6
A4 Project Task Organization	6
A5 Problem Definition/Background	9
A6 Project and Task Description	11
A6.1 Project Schedule and Deliverables	14
A7 Quality Objectives and Criteria for Measurement Data	18
A8 Special Training Requirements/Certification	18
A9 Documentation and Records	19
A9.1 Reporting Format and Storage	20
B Data Generation and Acquisition	21
B1 Sampling Design	21
B2 Sampling Methods	22
B2.1 Surface Water Sampling at Springs	22
B2.2 Field Health and Safety Procedures	23
B2.3 Field Variances	24
B2.4 Decontamination Procedures	24
B2.5 Disposal of Residual Materials	24
B3 Sample Handling and Custody	25
B4 Field Measurement Methods	25
B5 Quality Control	25
B5.1 Field Sampling Quality Control	26
B5.2 Data Entry Quality Control	26
B6 Instrument/Equipment Testing, Inspection, and Maintenance	27
B7 Instrument/Equipment Calibration and Frequency	
B8 Inspection and Acceptance of Supplies and Consumables	27

B8.1 Field Sampling Supplies and Consumables	27
B9 Non-Direct Measurements	27
B10 Data Management	28
B10.1 Data Acquisition, Direct Measurements	28
C Assessment and Oversight	29
C1 Assessment/Oversight and Response Actions	29
C2 Reports to Management	29
D Data Review and Usability	29
D1 Data Review, Verification, and Validation Requirements	29
D2 Verification and Validation Methods	30
D3 Reconciliation with User Requirements	30
E References	30
F Appendices	33
Appendix 1: Receiving Form	33
Appendix 2: Springs Inventory Protocol	34
Appendix 3: Springs Ecosystem Assessment Protocol (SEAP)	34
Appendix 4: Groundwater Dependent Ecosystem (GDE) Protocol	34
Appendix 5: Springs Online Manual	34
List of Tables Table 1: Roles and responsibilities from SWQB, MNA-SSI, and US EPA Table 2: Tasks, Timeline, Deliverables, and Staff Assigned Table 3: Data Quality Indicators Table 4: Discharge magnitudes modified from Springer et al. (2008), ranges of disfor class, and recommended instruments to measure discharge.	15 18 scharge
List of Figures Figure 1: Organizational Chart of Key Personnel. Figure 2: Map of New Mexico with the study area (Ecoregion 23) identified. The parea includes Catron, Sierra, Grant, and Luna Counties at elevations within the Giamountains of New Mexico where springs occur from approximately 4,000 feet (ft. 2000 ft.)	project la

#### **List of Abbreviations**

AA Assessment Area
ABS Above Sea Level
CD Compact disc
CWA Clean Water Act

DOQQ Digital Orthophoto Quarter Quadrangles

DOT Department of Transportation

DQI Data Quality Indicators
DQO Data Quality Objectives

EPA United States Environmental Protection Agency

FY Fiscal Year

GDE Groundwater Dependent Ecosystem
GIS Geographic Information System
GPS Global Positioning System
HGM Hydrogeomorphic Method
HUC Hydrologic Unit Codes
MNA Museum of Northern Arizona

MNA Museum of Northern Arizona MQO Measurement Quality Objectives

NA Not Applicable

NEPA National Environmental Policy Act

NHNM Natural Heritage New Mexico, University of New Mexico

NMED New Mexico Environment Department
NMRAM New Mexico Rapid Assessment Method

NWI National Wetlands Inventory

PO Project Officer
QA Quality Assurance
QC Quality Control

QAPP Quality Assurance Project Plan

RA Rapid Assessment

RID Request Identification Number

SEAP Springs Ecosystem Assessment Protocol

**SOP** Standard Operating Procedures

SSI Springs Stewardship Institute ("Contractor")
SQUID Surface Water Quality Information Database

SWQB New Mexico Environment Department Surface Water Quality

Bureau

US EPA United States Environmental Protection Agency

WOI Wetland of Interest

WPS Watershed Protection Section
WPC Wetlands Program Coordinator
WPO Wetlands Program Project Officer

#### **A3 Distribution List**

This EPA-approved Quality Assurance Project Plan (QAPP) signed original will be kept on file at SWQB and a copy will be kept on file at the lead contractor's office (Museum of Northern Arizona, Springs Stewardship Institute (MNA-SSI)).

The Wetlands Program Project Officer (WPO) will ensure that copies of this approved QAPP and any subsequent revisions are distributed to the project personnel listed below. The MNA-SSI Director will ensure that any SSI staff involved in data collection or analysis for this project have access to a copy of this QAPP, review its contents, and follow its quality assurance procedures. Upon receipt of the QAPP, those on the distribution list will sign the Acknowledgement Statement and return it to the File Manager.

The following individuals will receive copies of the approved QAPP and any subsequent revisions.

## A3.1 New Mexico Environment Department Surface Water Quality Bureau (SWQB)

Watershed Protection Section Program Manager: Abraham Franklin, (505) 827-2793

Wetlands Program Coordinator and File Manager: Maryann McGraw, (505) 827-0581

Quality Assurance (QA) Officer: Miguel Montoya, (505) 827-2637

Wetlands Program Project Officer (WPO), Rapid Assessment (RA) Wetlands Data Collection Scientist: John Moeny, (575) 956-1545

RA Wetlands Data Collection Scientist: Emile Sawyer, (505) 827-2827

RA Wetlands Data Collection Scientist: Susan Ossim, (575) 956-1548

RA Wetlands Data Collection Scientist: Karen Menetrey, (505) 827-0194

### A3.2 Springs Stewardship Institute ("Contractor")

MNA-SSI Director: Lawrence Stevens, Ph.D. (928) 774-5211 x231

#### A3.3 U.S. Environmental Protection Agency Region 6

Chief: Curry Jones, State and Tribal Programs Section, (214) 665-6793

**Project Officer:** Sharon Daugherty, Water Quality Protection Division, (214) 665-2259

#### **A4 Project Task Organization**

Table A4.1 lists the roles and responsibilities of persons that will collect and/or use the information gathered for the classification verification, wetlands assessment, and multi-metric analyses. A project organizational chart (Figure 1) displays hierarchy of the project.

Table 1: Roles and responsibilities from SWQB, MNA-SSI, and US EPA.

Name	Organization	Role	Responsibilities	Contact Information
Abe Franklin	SWQB	Watershed Protection Section Program Manager	Review of final project report and key deliverables including field guide and manual.	(505) 827-2793 Abe.franklin@state.nm.us
Maryann McGraw	SWQB	Wetlands Program Coordinator: Project Oversite; File Manager	Principal Investigator, Assessment Team, assist in site selection, metrics selection, protocol and data management, data transfer and distribution activities. Maintain Wetlands Program project files.	(505) 827-0581 maryann.mcgraw@state.nm .us
Miguel Montoya	SWQB	QA Officer	Review and approval of QAPP, QA audits, as needed, to assure adherence to the approved QAPP,	(505) 476-3794 miguel.montoya@state.nm. us
John Moeny	SWQB	WPO, Data Collection Team	Coordinate project actions of Assessment and Data Collection Teams, ensure project completion and timeliness, serve as liaison between contractor, SWQB, technical advisory committee, and EPA. Assist with field data collection.	(575) 956-1545 John.moeny@state.nm.us
Emile Sawyer	SWQB	Data Collection Team	Serve on technical advisory committee, assist with field data collection.	(505) 827-2827 emile.sawyer.state.nm.us
Susan Ossim	SWQB	Data Collection Team	Serve on technical advisory committee, assist with field data collection.	(575) 956-1547 Susan.ossim@state.nm.us
Karen Menetrey	SWQB	Data Collection Team	Serve on technical advisory committee, assist with field data collection.	(505) 827-0194 karen.menetrey@state.nm.u s
Larry Stevens	MNA-SSI	SSI Principal Investigator	Contract Principal Investigator, springs data collection method and workbook development and refinement, point of contact for SSI QA, reporting	(928) 774-5211 x231 Larry@springstewardship.or g
Jeri Ledbetter	MNA-SSI	SSI Program Manager	SSI administration, QAPP review, database maintenance and modifications, training design and leadership, inventory crew lead, quality control, GIS data compilation, manual and field sheet development and design, reporting	(928) 774-5211 x270 Jeri@springstewardship.org

Name	Organization	Role	Responsibilities	Contact Information
Jeff Jenness	MNA-SSI	SSI GIS Analyst	SSI mapping, GIS data import, analysis, management, and quality control. Imports external springs datasets	(928) 774-5211 x231 Jeff@springstewardship.org
Ed Schenk	MNA-SSI	SSI Project Manager	Develop and refine QAPP, maintain daily tasks for field and lab techs, training planning, inventory crew lead, manual and field sheet refinement, reporting	(928) 774-5211 x231 Ed@springstewardship.org
Tierney Schipper	MNA-SSI	SSI Administrative Assistant	Administration, reporting, manual and field sheet design	(928) 774-5211 x231 tschipper@musnaz.org
Gloria Hardwick	VR Enterprises	SSI Subcontractor	Review QAPP, inventory crew botanist, manual and field sheet refinement, reporting	(928) 774-5211 x231 Gloria@springstewardship.o
Alek Mendoza	MNA-SSI	SSI Intern	General support, inventory crew	(928) 774-5211 x231 amendoza@musnaz.org
Wendel J. Hann, PhD	Habitat Trends, Inc.	SSI Subcontractor	Review and refine QAPP, manual, and field sheets; site selection, inventory crew	(575) 519-9734 WendelHann@gmail.com
Glenn Rink	Far Out Botany	SSI Subcontractor	Field crew botanist, data review and analysis	faroutbotany@gmail.com
Abe Springer, PhD	Northern Arizona University	SSI Subcontractor	Review subclass definitions, manual and field sheets, site selection, inventory crew, support end user training	(928) 523-7198 abe.springer@nau.edu
Ben Brandt		SSI Subcontractor	Database design	(520) 203-1601 Benjamin.Brandt@nau.edu
Sharon Daugherty	U.S. EPA	EPA Project Officer	QAPP review and approval	(214) 665-7187 Daugherty.sharon@epa.gov
Curry Jones	U.S. EPA	EPA Management	QAPP review and approval	(214) 665-8093 Jones.curry@epa.gov

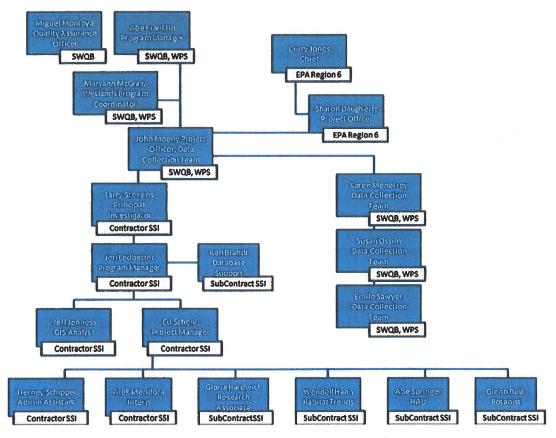


Figure 1: Organizational Chart of Key Personnel.

#### A5 Problem Definition/Background

Many of New Mexico's high priority wetland systems are supported by springs. Springs are ecosystems where groundwater is exposed at, and typically flows from the Earth's surface. Springs occur in many settings, both underwater as well as in terrestrial environments. They vary greatly in flow, water chemistry, geomorphic form, and ecological complexity (Springer et al. 2008, Springer and Stevens 2009). Seeps are simply small springs, usually with immeasurably diffuse or small discharge.

New Mexico supports a great abundance of springs, which are among the most productive and important ecosystems in the State. Springs provide important ecosystem functions including wildlife water source, headwater and streamflow maintenance, conservation of biodiversity, and maintenance of distribution and abundance of vertebrates as well as other functions. They provide crucial habitat for many of the state's wildlife and aquatic species, of which many are endemic or recognized as sensitive. These ecological functions are crucial especially in areas of New Mexico where springs are the only permanent source of water.

Springs provide many of New Mexico's ranches and farms with domestic and livestock water. Springs also are of historical, cultural and archaeological significance and are important to the many pueblos and tribes in New Mexico. Springs can be sustainably used for water supplies or other services while still providing many natural ecological functions. Appropriate protection and stewardship of springs enhances both property value and the integrity of New Mexico's natural heritage.

Understanding the current condition and state of the springs of New Mexico is important for protecting, restoring, and maintaining springs for the beneficial uses listed in the previous paragraph. The State of New Mexico currently does not have a rapid assessment method for springs. The existing wetlands rapid assessment method is unsuitable for springs assessments as it does not take into account the unique geomorphic, hydrologic, and biologic setting of springs emergences nor their position on the landscape.

The basic assumption underlying the development of this rapid assessment method is that wetland condition varies across one or more disturbance gradients, and that the resultant state can be evaluated based on a set of landscape-level measurements, in combination with visible field metrics and characterization of stressors that affect wetland ecological integrity (Fennessy et al., 2004). Processes that function at both the landscape scale and the local scale influence ecosystem structure and function, and often alter natural processes of hydrologic regimes, materials transport and deposition, and vegetation and faunal assemblages. In addition, groundwater-dependent ecosystems are subject to changes that affect the contributing aquifer.

This rapid assessment is designed to assess the ambient condition of a subset of the Springs subclass of wetlands found within the Slope hydrogeomorphic (HGM) class of wetlands (Brinson et al. 1993). The purpose of defining a subclass is to reduce the natural variability in wetland type as well as variabilities that occur with latitude, altitude, climate and geomorphology. The selection of sample springs in this project is designed to collect and review rapid assessment protocols using an array of springs across a continuum of ecological condition, from relatively undisturbed to highly degraded sites. Through the process of field sampling and evaluation of protocols, the NMRAM can be tested and improved before it is more broadly applied.

The NMRAM is meant to provide a cost-effective tool to obtain information about the condition of wetlands that may be employed by a variety of users from different agencies and institutions. Additional objectives for NMRAM development include identifying and evaluating 1) abundance, distribution and condition of wetlands in the subclass within the region, including associated habitat, water quality, and other functions, above a threshold to maintain ecological services; 2) reference wetland conditions within the subclass; 3) wetland protection needs for the subclass; 4) potential wetland restoration parameters and metrics that may be used to measure wetland restoration effectiveness and recovery; 5) the effects of environmental stressors within the wetlands; and 6) locations to serve as restoration opportunities for the subclass within the region.

Water resources assessments and management have become priority since the 1948 Federal Water Pollution Control Act and the 1972 amendments contained in the Federal Water Pollution Control Act. Rapid bioassessments (e.g., Barbour et al. 1999) have become standard approaches to evaluate the quality and biotic health of bodies of water and wetlands, and hydrogeomorphic assessments (e.g., Brinson et al. 1995; SSI) have become important tools for determining the hydrologic function of water

bodies and wetlands. Wetland rapid assessment methods have evolved to combine aspects of both bioassessments and hydrogeomorphic assessments. Rapid assessment of wetlands assumes that conditions can be evaluated based on a set of observable indicators or parameters and metrics, and that ecological conditions vary across environmental stress gradients. Rapid springs assessment protocols also involve consideration of aquifer integrity, non-channel site geomorphology, as well as assemblage composition, structure, and function (Springer et al. 2015). Rapid assessments are based upon three basic principles: 1) assessments are relative to existing conditions only, 2) the method is rapid such that a team of three experts can complete the field assessment and data analysis for the assessment in one day, and 3) the assessment is based primarily on observed field conditions (Fennessy et al. 2004). NMRAM is being developed in accordance with these basic principles.

#### **A6 Project and Task Description**

This Project will employ an existing inventory of spring locations in Ecoregion 23 (Figure 2). The first step will be to review the inventory of project area springs with the NMRAM Assessment Team composed of MNA-SSI and SWQB Wetlands Program staff, to reduce the number of springs to be evaluated to a suite that most efficiently supports protocol developing and testing. This subset (roughly 100 selected reference sites) will be assigned a preliminary ranking based on best professional judgment and familiarity with the springs by members of the NMRAM Assessment Team.

In addition, NMRAM Assessment Team will review existing rapid assessment metrics and protocols from other springs assessment methods (Sada and Pohlmann 2006, US Forest Service 2012, Stevens et al 2016), and select a preliminary set of metrics that will be reviewed and potentially tested for use in the NMRAM. This information (potential sites and preliminary set of metrics) will be presented to an Advisory Committee (composed of local private, non-governmental organization and agency personnel familiar with wetlands, springs, and the Reference Domain) for their input on the metric selection and preliminary rankings by the NMRAM Assessment Team.

A Pilot Study will be conducted in which a small set of springs (5-10) will be visited by the data collection teams consisting of NMED staff, and the Springs Stewardship Institute and their subcontractors, to discuss the preliminary rankings, the potential utility of the selected metrics, and to determine if additional metrics should be included, created, or modified to meet the objectives of the NMRAM.

From this study, a draft set of GIS and field protocols and data sheets will be created for data collection at 30-40 carefully selected sites that represent disturbance continuum. Data collection protocols will include geographic information system (GIS) map evaluations using different land feature and land use map layers (Level 1); and field-based rapid assessment (Level 2) of landscape, abiotic, and biotic attributes using the selected metrics and protocols. SSI has developed Springs Online (http://springsdata.org/), a secure, user-friendly, relational database in which to enter, QAQC, archive springs-related inventory and assessment data, and which provides instant programmed reporting, as well as downloading capability for

Revision Date: January 28, 2018

individual variables of interest, either over time at one springs ecosystem, or among springs in a landscape.

Stressor checklists will be developed or modified from existing NMRAM stressor checklist grouped by four attributes—land use, vegetation, physical structure and hydrologic modification. These checklists will be used to identify and evaluate the intensity of stressors at each site. Stressors are expected to have a negative effect on the condition of the site, and may provide insight into the ecological integrity of the springs wetlands.

The draft set of NMRAM GIS and field metrics and field sheets for springs of Ecoregion 23 will be used for data collection to:

- Verify the suitability of the selected metrics to inform condition of the springs ecosystem
- Calibrate metric sensitivity relative to the range of variability in springs condition
- Determine the time and effort it takes to conduct NMRAM assessments
- Determine how stressor type, location and intensity relates to springs condition
- Determine the level of experience needed for a team to conduct the NMRAM
- Determine if the outcome provides the information needed to meet the SWQB project goals and NMRAM goals
- Determine site scoring and weighting factors based on condition

The data collection sheets include a Rank Summary Worksheet where the metric ratings are compiled, weighted by importance and sensitivity and summarized for each attribute. Using the attribute scores, the site is given an overall weighted Condition Rank, ranging from excellent to poor.

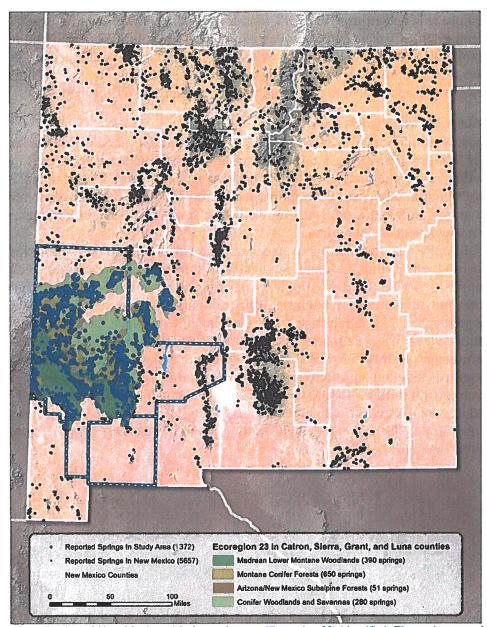


Figure 2: Map of New Mexico with the study area (Ecoregion 23) identified. The project area includes Catron, Sierra, Grant, and Luna Counties at elevations within the Gila Mountains of New Mexico where springs occur from approximately 4,000 feet (ft) to 7,900 ft.

SSI and the WPO will conduct a training day in the field to ensure that all participants in data collection efforts are familiar with the requirements in the QAPP and understand the field protocols for collection of quality data from the selected sites. Safety protocols also will be reviewed on this training day. The crew leaders will ensure that all field sheets and data are collected and recorded at the end of each field day, and will back up all data sheets either by photographing or copying to a separate hard drive.

Once data collection is concluded, a review meeting will be scheduled for the NMRAM Assessment Team and the Data Collection Team to review the data collection

efforts. The data will be entered into SSI databases for review and multi-metric analyses to ensure the efficacy of all the selected metrics. Draft final Manual Chapter, Field Guide and data collection worksheets will be completed by SSI and reviewed by SWQB project staff, and prepared for end-user training. A draft and final report of the project will be prepared by SSI and reviewed and accepted by SWQB project staff.

#### A6.1 Project Schedule and Deliverables

The project was initiated on 8 January 2018, and is scheduled to be completed by 31 May 2019. The project schedule and deliverables are summarized in Table 2 by task, responsible party and month, and include submission of: draft and final QAPP; quarterly, draft final, and final project reports; draft and final geodatabases; draft and final project maps; and submission of the draft and final "NMRAM for Springs in Southwestern New Mexico" field guide.

The SWQB WPO will track project progress through invoice task completion reports associated with reimbursement requests and through Contractor quarterly progress reports to SWQB. SSI will employ project planning software to track task progress, staff and subcontractor resource utilization, and time planned vs. actual, including dependencies for certain tasks that, if delayed, will affect the schedule. If delays or other issues are recognized by SSI, the SWQB WPO will be notified to develop contingency plans. The SWQB WPO will coordinate with MNA-SSI on contingency plans. Some events may be beyond the control of either MNA-SSI or SWQB, for example limited access to US Forest Service managed lands due to high fire danger. In that example, work will shift to non USFS lands and return once forest restrictions are lifted. Project delays will be documented and described in semi-annuals reports filed with the EPA.

Table 2: Tasks, Timeline, Deliverables, and Key Personnel Assigned.

Task	Schedule	SSI Deliverable(s)	Responsible Parties
Preliminary contractor meeting	January 15- February 4, 2018	Provide meeting notes to SWQB Project Manager confirming project objectives, timelines established and accepted, roles and responsibilities delineated	Stevens, Ledbetter, Schenk, Moeny
Quality Assurance Project Plan	January – February 2018	Prepare QAPP and signature page (this document) for review and approval by SWQB and EPA.	McGraw, Moeny, Stevens, Ledbetter, Schenk, Hann
Preliminary data gathering and organization	January - April 2018	Map layers containing locations of springs within the project area and associated physical, biological and administrative attributes, literature search of existing data and locations of springs within the project area.	Stevens, Ledbetter, Schenk, Jenness, Hardwick, Mendoza
Identification of subclasses	February - April 2018	Written descriptions of springs types and a logical classification of similar springs into subclasses.	Stevens, Ledbetter, Schenk, Jenness, Springer
Identify and develop assessment metrics	February - April 2018	Written description of assessment metrics and a rationale for their selection. Written description of stressor checklists, preliminary data collection field sheets and field instructions.	Moeny, Sawyer, Ossim, McGraw, Stevens, Ledbetter, Schenk, Jenness, Hardwick, Springer, Hann
Advisory committee meetings	Spring 2018 and Spring 2019	Meeting agenda, presentation, sign-in sheets, and meeting minutes. SSI will provide these items which will be included in project semiannual reports to the EPA by the SWQB-WPO.	Moeny, Stevens, Ledbetter, Schenk, Jenness, Hann, Springer
Site selection for field evaluation	March-April 2018	100 potential sites selected and assigned a preliminary rank, in addition to detailed data for a minimum of 40 of those sites to be evaluated.	Moeny, Stevens, Ledbetter, Schenk, Jenness, Hann

Task	Schedule	SSI Deliverable(s)	Responsible Parties
Conduct pilot study	May 2018	Collect site information and field data from a subset of identified springs to test the utility of selected metrics, identify data gaps or additional metrics, and stressor checklists. Results of pilot study will be reviewed by SSI, SWQB and the advisory committee. All parties will come to consensus prior to advancing to a larger field test.	Moeny, Ossim, Sawyer, McGraw, Stevens, Ledbetter, Schenk, Jenness, Hann, Springer
Assess a minimum of 40 spring sites	June-July 2018	Prepare field packets including obtaining all entry and archaeological permissions, field datasheets, site maps, directions to sites, safety requirements, supplies. Provide training to Data Collection Team on first data collection day to ensure all protocols are understood. Include available background information on spring location, ownership, physical and biological attributes.	Moeny, Ossim, Sawyer, Stevens, Ledbetter, Schenk, Jenness, Mendoza, and subcontractors Hardwick, Hann, and Springer.
Review field data and conduct data analyses, revise manual, field guide and data collection worksheets.	June 2018 - Feb. 2019	Data entry and data quality review, review of metrics with NMRAM Assessment Team and Data Collection Team and quantitative analysis of metrics sensitivity for rating condition of springs. Revised versions of Manual, Field Guide and Data Collection Worksheets	Data Entry and data quality review: Stevens, Ledbetter, Schenk, Jenness, Mendoza, Hardwick, and NAU. Review of assessment and metric performance: Moeny, McGraw, Ossim Sawyer, Stevens, Ledbetter, Schenk, Schipper, and Hardwick. Revisions: Moeny, Stevens, Ledbetter, Schenk, Schipper.
End-User training for NMED/SWQB staff, Natural Resource Managers at Federal, State and Local levels, NGOs	February - April 2019	Written training description and agenda, presentations, sign-in sheets, field data collection sheets from training.	Moeny, Stevens, Ledbetter, Schenk, Hann, Springer, and Hardwick

Revision Date: January 28, 2018

Task	Schedule	SSI Deliverable(s)	Responsible Parties
engaged in watershed			
protection and conservation,			
wetland restoration			
practitioners, member of the			
public with an interest in spring			
function and assessment			
Quarterly and final reports	Quarterly	Quarterly reports of project progress, Draft Final	Moeny, Stevens, Ledbetter, Schenk,
		Report and Final Report	Jenness, subcontractors

#### A7 Quality Objectives and Criteria for Measurement Data

This section describes the data quality objectives of the project, identifies the targeted action limits and levels, and defines the measurement performance or acceptance criteria deemed necessary to meet those objectives.

The purpose of this project is to expand the knowledge of the locations, extent, and condition of springs in New Mexico by developing a NMRAM for springs inventory and assessment to enhance the State's Springs Wetlands Program. Data quality will be measured against the quantitative and qualitative data quality indicators described below and in accordance with Section 1.5 of the SWQB QAPP (SWQB, 2016)

**Table 3: Data Quality Indicators** 

Data Quality Indicator	Data Acquisition
Precision	Precision will be ensured by consistently assigning the same staff the responsibilities of collecting, recording and analyzing data.
Accuracy	Accuracy based on the use of methods determined to be reliable, and tested through the pilot and subsequent field inventory components
Bias	Bias will be reduced by using professional and experienced staff to collect and analyze data
Representativeness	Sample selection is representative of the entire sample unit.
Comparability	This project will collect new data where no data are available for comparison.  However, methods for data collection are standardized and reproducible.
Completeness	All known sites within the subclass were selected to assess the range of conditions.
Sensitivity	Sensitivity of the metrics used will be analyzed during the analysis and recalibration Task of this project.

#### A8 Special Training Requirements/Certification

SWQB has qualified and experienced scientific staff, including GIS staff, with applicable skills and scientific back round to help carry out and administer this project. In addition, the Wetlands Program is using qualified and experienced contractors to carry out this EPA-funded Rapid Assessment of Wetlands (Springs Stewardship Institute), which will include a validation of spatial attributes applied to the assessment sites. The Assessment and Technical Teams for Rapid Assessment will be given a copy of this QAPP and will be instructed in appropriate validation and ground truth techniques.

Maryann McGraw (WPC), received her Bachelor's and Master's Degrees in Geology from University of Texas at Austin, and is an Environmental Scientist/Specialist Supervisor for SWQB. Maryann has been the principal investigator and contributing author for all NMRAMs to date. She has attended advanced training sessions in fluvial geomorphology assessment of stream conditions and departures conducted by Dave Rosgen, California Rapid Assessment Method (CRAM), HGM training, NWCA training and Stream Pyramid Training. The

WPC has also conducted monitoring of riparian areas and assisted monitoring protocols for other wetlands projects during the last 10 years. She worked for NRCS Los Lunas Plant Materials Center propagating wetland plants. She has also participated in the development of the Rio Puerco Monitoring Manual and is qualified for developing assessment criteria, conducting and participating in the training, and for overseeing and managing any of the monitoring procedures specified for this project.

John Moeny serves as Project Manager and data collection technician for this project. He is an Environmental Scientist-Specialist for the SWQB in the Silver City field office where he oversees regional water quality and wetland improvement projects. Prior to working for the Environment Department, John worked throughout the Rocky Mountain west on range inventory and restoration, wetland restoration, invasive species ecology, floristic inventories and wildland fire ecology. He holds an undergraduate degree in Botany from Colorado State University and a Master's in Range Science from New Mexico State University.

Emile Sawyer serves as data collection technician for this project. He is an Environmental Scientist-Specialist and Wetlands Program team member for the Surface Water Quality Bureau, based in the Santa Fe Office. Prior to attending New Mexico Highlands University, where he earned his Environmental Science - Geology degree in 2003, Mr. Sawyer worked from 1992 to 2003 as a contract forestry technician throughout the Rocky Mountains. He earned his M.S. in Hydrogeology from the University of Nevada - Reno in 2009. Mr. Sawyer's graduate research at the Desert Research Institute in Reno, Nevada was based on using stable isotopes to track groundwater flow and evaluate a water balance model in the Colorado Flow System of eastern Nevada.

Susan Ossim serves as data collection technician for this project. She is an Environmental Scientist-Specialist for the SWQB in the Silver City field office where she oversees regional water quality improvement projects in addition to Clean Water Act compliance and enforcement. Previous work includes the Office of the State Engineer to oversee water rights in the Lower Rio Grande in Southern NM, stream flow, and water sampling; and the Travis County Natural Resources Department, Austin, TX supporting the Balcones Canyonlands Preserve assisting in identifying and mapping invasive plant species and aquatic and terrestrial species counts prior to joining the NM Environment Department. She received an undergraduate degree in Natural Resource Management from Oregon State University.

**Contractor** qualifications are documented through resumes and professional references. The qualifications have been reviewed by the SWQB Wetlands Program Coordinator for this project. The documentation of this information will be kept in the SWQB project files managed by the File Manager. SSI staff resumes were submitted with the project proposal, and are available and regularly updated at <a href="http://springstewardshipinstitute.org/staff/">http://springstewardshipinstitute.org/staff/</a>

#### **A9 Documentation and Records**

Copies of this QAPP and any subsequent revisions will be provided to all individuals included on the distribution list by the SWQB Wetlands Program

Coordinator. The WPC will also distribute all applicable protocol documents and subsequent revisions used throughout the project to the appropriate contractors. SSI will prepare and submit inventory reports for each spring surveyed, along with quarterly project reports. These will be submitted to NMED, in accordance with the approved QAPP. The QAPP, protocol documents and inventory reports will be maintained on the SWQB Project Officer's hard drive, CD and in the project file at SWQB Santa Fe, SSI, and at the EPA Region 6 Wetlands Program.

This QAPP and referenced protocols include written procedures for all methods and procedures or protocols related to the collection, processing, analyses, reporting and tracking of environmental data

All data generated from this project and covered by this QAPP must be of sufficient quality to withstand challenges to their validity, accuracy and legibility. To meet this objective, data are recorded in standardized formats and in accordance with prescribed procedures.

The documentation of all environmental data collection activities must meet the following minimum requirements:

- 1. Data, data collection and analytical methods, and associated information must be documented directly, promptly, and legibly.
- 2. All reported data must be uniquely traceable to the raw data. All data reduction/transformation formulae must be documented.
- 3. All original data records include, as appropriate, a description of the data collected, units of measurement, unique sample identification (Request Identification [RID] number), station or location identification (if applicable), name and signature or initials of the person collecting the data, and date of collection.

Any changes to the original (raw data) entry must be clear and not obscure the original entry. Taxonomic refinements and translational typographic errors will be corrected on the field datasheets and in the database, with clear documentation of what and by whom those changes were made.

#### A9.1 Reporting Format and Storage

All field data will be recorded each day and for each metric on project-specific field data sheets. The field crew will scan a representative sample and email them to the SWQB WPO. After the field work, the SSI Program Manager will assign SSI personnel to enter the data into the Springs Online database. Typically this task is assigned to several personnel in order to reduce fatigue. Assigned staff may include the Project Manager, Data Technicians, interns, or contractors (e.g. botanist). The personnel entering data from a datasheet will sign and date each sheet when it is complete. The Springs Online database requires a username, password, and specific permissions to access and edit data, and tracks the username and date when records are added or edited. Once the data have been entered and corrected, the Project Manager will assign SSI staff to scan the field data sheets; these will be delivered to the SWQB WPO. The Springs Online database is housed at the Museum of Northern Arizona in Flagstaff, AZ with an incremental, hourly off-site backup. The Surface

Water Quality Information Database (SQUID) is the central repository for NMRAM data at SWQB. SSI will deliver the data, exported from Springs Online, into a geodatabase that includes all related tables and metadata to the NMED for inclusion in SWQB. Copies of the paper datasheets will be kept in the project file at SWQB and the SSI office in Flagstaff, AZ. A list of sites visited and site scores will be provided by the WPO to EPA Region 6 Wetlands Program as a deliverable attachment to the semi-annual reports. The data collection report produced by the Contractors and SWQB will include scans of the data collection worksheets in an appendix.

#### **B DATA GENERATION AND ACQUISITION**

Level 1 metrics (e.g. elevation, coordinates, land ownership, 8- and 12-digit HUC, USGS Quad) for all sites within the study area will be generated using GIS analysis and imported into Springs Online prior to any fieldwork. For the selected sites, using aerial imagery and remote sensing data, SSI will refine the location and compile additional information, such as land use intensity. SSI staff will import this information into field survey forms, and also create a map that survey crews can use to locate the site. The reported location will be identified on the GIS map. The Level 1 metrics data will be field verified or corrected, and the GIS maps will become part of the NMRAM Assessment Package for that site. The field teams (Data Collection Teams), supervised by a trained data collection Team Leader, will locate and identify the Sample Area (the area influenced by the spring). Data Collection Teams will document Level 2 field data within the Sample Area on field survey forms. For each metric a score and a rank will be assigned and entered on the field survey forms. The completed metric scores and ranks are then incorporated into a final wetland condition score and rank. The Data Collection Team Leader will check field sheets for accuracy and completeness prior to leaving the site. A representative set of field sheets will be scanned and sent to the WPO and/or SSI Program Manager for further inspection and review. SSI staff who have been trained in data entry procedures will enter the data into the Springs Online relational database when back in internet service. This task will be assigned by the SSI Project Manager, with the workload shared among several SSI personnel. This may include the Project Manager, data technicians, contract botanists, interns, or NAU students. Once entered into Springs Online relational database, the data can be exported by users using standardized reports into spreadsheets for quality control checks or further metric analyses. They may also be exported into summary reports in MS Word.

#### **B1 Sampling Design**

SSI will conduct a coarse, landscape-scale Level 1 springs distribution assessment, using all readily available literature and agency sources, compiling these data into the Springs Online database. Data are exported nightly into a geodatabase that will be used to determine, to the extent possible, the type, condition, and potential for use the initial pilot and subsequent inventory tasks. A suite of 100 candidate springs will be selected for investigation through consultation with the SWQB and members of the Advisory Committee. From these, 5-10 springs will be

Revision Date: January 28, 2018

selected for the pilot investigation to capture the widest array of conditions on which to test and refine selected protocols, and to determine protocol gaps.

Inventory and assessment protocols will follow Stevens et al. (2016) Level 2 springs inventory and assessment protocols, enhanced through the literature review (e.g., Vinson and Bushman 2005) and through advisement of the SWQB and advisory committee to provide the most robust and up-to-date methodology for the NMRAM for Springs of Southwestern New Mexico. From the 100 candidate springs, 40 sites will be selected for Level 2 inventory. Those 40 springs will be selected by distinguishing type, proximity, and elevation (clustered springs are likely to be more similar), and subsequently by composite anthropogenic use intensity. Use intensity metrics will be developed using geographic and remotely sensed measures of land ownership, use, road proximity, site name, and other factors, to be agreed upon through the SWQB and advisory committee. Composite ranking will be applied to the suite of 100 candidate springs, the first 40 of which will be selected for the inventory, and with 15-20 of the next most highly ranked sites held in reserve in case one or more of the initial 40 springs is inaccessible because of safety or unforeseen conditions.

#### **B2 Sampling Methods**

The draft metrics will be designed to measure aspects of condition that are relative to the reference conditions for an intact and functioning springs based on the literature cited in the reference section of this QAPP, previous springs inventories in the Southwest, and on best professional judgment. The metrics are also designed to follow similar protocols that were already developed for other springs inventories in Arizona and Nevada. Potential metrics are not limited to the list below but are provided as an example of the types of data to be assessed. A list of potential field measurements is included in Appendix 2.

#### **B2.1 Surface Water Sampling at Springs**

Flow measurement techniques vary by setting (Table 3), and the field sheet will provide space for documenting the method(s) used to measure springs flow. Replicated flow measurements are needed to develop a statistically credible estimate of the quantity of water discharging from a springs ecosystem. SSI protocols involve taking at least six replicated flow measurements during the one-time sampling event to calculate an accurate average value. Flow measurements will be taken during the course of the spring inventory that typically last 1- 3 hours depending on spring type and complexity. If the discharge of the spring is low (Springer et al's first magnitude spring flow), the discharge measurement may take dozens of minutes and should be initiated early during the site visit. Second to fifth magnitude discharge is relatively faster and easier to measure. The name, serial number (if available), and accuracy of the instrument(s) used to measure flow is recorded on the field sheet and in Springs Online.

The Contractor will use the most appropriate method to measure springs flow, ranging from the measurement of wetted patch area when flow is unmeasurable, to

timed flow capture, or flume or cross-section-based measurements, as described in the SSI protocols (Stevens et al. 2016, Appendix 2; Table 4).

Table 4: Discharge magnitudes modified from Springer et al. (2008), ranges of discharge for class, and recommended instruments to measure discharge.

Discharge Magnitude	Discharge (English)	Discharge (metric)	Instrument(s)
Zero	No discernable discharge	No discernable discharge	Depression
First	< 0.16 gpm	< 10 mL/s	Depression, Volumetric
Second	0.16 - 1.58 gpm	10 - 100 mL/s	Weir, Volumetric
Third	1.58 - 15.8 gpm	0.10 - 1.0 L/s	Volumetric, Weir, Flume
Fourth	15.8 - 158 gpm	1.0 - 10 L/s	Weir, Flume
Fifth	158 -1,580 gpm; 0.35 - 3.53 cfs	10 - 100 L/s	Flume
Sixth	1,580 - 15,800 gpm; 3.53 - 35.3 cfs	0.10 - 1.0 m <sup>3</sup> /s	Current Meter
Seventh	35.3 - 353 cfs	1.0 - 10 m <sup>3</sup> /s	Current Meter
Eighth	353 - 3,531 cfs	10 - 100 m <sup>3</sup> /s	Current Meter
Ninth	3,531 - 35,315 cfs	100 -1,000 m <sup>3</sup> /s	Current Meter
Tenth	> 35,315 cfs	> 1,000 m <sup>3</sup> /s	Current Meter

#### **B2.2 Field Health and Safety Procedures**

Contractor field crews, in conjunction with SWQB data collection team will conduct field trips to complete inventory and assessment work. These will be scheduled during the springtime or autumn for springs and wetlands at lower elevations, and summertime for springs at higher elevations. High elevation springs wetland surveys will be scheduled to avoid thunderstorm activity, and in warmer weather while plants are more likely to be in bloom for purposes of identification.

Safety is of primary importance to field studies. Only sites that are safely accessible will be sampled. Unsafe sites include, but are not limited to, private lands not granting permission access, areas with evidence of illegal activities).

In remote areas, the crew will always carry sufficient supplies of water, food, flashlights, shovels, extra spare tires, and first aid and emergency supplies to deal with accidents and unexpected circumstances, such as rapid changes in weather. Hard hats and closed-toe boots are required in burned or construction areas. Teams should have adequate communication devices for their location (cell phones, two-way radios, satellite phone, SPOT devices, etc.). A field team will consist, at minimum of a geographer, a biologist, and a hydrogeologist, as well as NMED staff, and may include additional assistants. A designated crew leader will be responsible for field trip decisions, crew performance, and data compilation. At least one member of each Contractor field team of 3-5 crew will have at a minimum Wilderness First Aid training with Wilderness First Responder training required for any remote or hazardous terrain. Livestock or 4x4 training will be provided by the on-site contract stock manager.

Revision Date: January 28, 2018

#### **B2.3 Field Variances**

As field conditions vary there may be the need for safety, common sense, or local site variables that prohibit or require minor adjustments to the sampling procedures and protocols described in Appendix 2, and refined during the pilot springs sampling task. Such changes must be reported to the crew leader and that information passed on to the QAO. If there is a deviation from the QAPP, the project manager/project coordinator must notify the QAO and provide written notification of the proposed changes and explanation on the reasoning behind the change. Upon the QAO's approval, modification to the QAPP will be sent to the EPA for review and approval. Sampling problems, minor adjustments of field sampling, and QAPP modifications will be documented in any quarterly or annual reports to the US EPA Grants Project Officer. Similar procedures for noting modifications to protocol will be included in the Level 2 wetland method.

#### **B2.4 Decontamination Procedures**

Field equipment will be decontaminated between sites using a dilute bleach solution. This decontamination procedure is needed to prevent the spread of aquatic and terrestrial invasive species. Field clothing, including boots, will be decontaminated using a dilute bleach solution either in the field or by frequent laundry machine application. Disposal of decontamination fluids and rinse fluids is described below under "Disposal of Residual Materials".

No field decontamination of sample bottles/containers is needed. All sampling bottles will be pre-sterilized by the manufacturer. Any gloves used during the sampling regime will be considered disposable and will be packaged for disposal appropriately between sites.

#### **B2.5 Disposal of Residual Materials**

In the process of sampling springs there may be a small amount of waste, including used personal protective equipment (PPE), disposable sampling bottles/equipment, and one-time use calibration solution standards. The USEPA's National Contingency Plan requires that management of the wastes generated during sampling comply with all applicable or relevant and appropriate requirements to the extent practicable. Residuals generated for this project will be handled in a manner consistent with the Office of Emergency and Remedial Response (OERR) Directive 9345.3-02 (May 1991), which provides the guidance for the management of wastes. In addition, other legal and practical considerations that may affect the handling of the wastes will be considered, as follows:

Used PPE and disposable containers or equipment will be bagged and placed in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill. Any used PPE and disposable containers or equipment (even if it appears to be reusable) will be rendered inoperable before disposal in the refuse dumpster.

Decontamination fluids generated in the sampling event could consist of deionized water, residual contaminants, and water with non-phosphate detergent. Decontamination fluids will be disposed into a municipal sewerage or onto an

impervious surface for evaporation, at least 50 m from the springs.. However, excess water collected for sample container filling will be poured onto the ground.

#### **B3 Sample Handling and Custody**

No samples are expected to be collected for analysis at a laboratory for this project, although SWQB staff may collect samples for other purposes during field excursions. B4 Analytical Methods

#### **B4 Field Measurement Methods**

The Stevens et al. (2016) springs inventory protocols recommends collecting a large suite of field measurements during Level 1 (georeferencing) and Level 2 (rapid comprehensive inventory) springs surveys. Level 2 analytical measurements include field water quality and solar radiation. Field water quality metrics include pH, temperature, conductivity, alkalinity, and dissolved oxygen concentration. Field water quality data collection can be conducted using several number of analytical methods and instruments. In general, contractor teams use Hach, Hanna, and YSI portable data sondes as well as field test kits manufactured by ChemMets and Hach. Data sondes are calibrated daily prior to use. All field water quality meters will be used and calibrated according to manufacturer standards and SWQB SOPs for calibration (SOP 6.1) and deployment (SOP 6.2). . The exact water quality tools to be used at a given site may vary, depending on conditions. Because of this, field data sheets include a field for the type of instrument and manufacturer. This field also is copied into the Springs Online database for full transparency of methods and potential error. A calibration log also will be maintained. A full list of field measurements and recommended field equipment is included in Appendix 2. General NMED SOPs can be found at <u>www.env.nm.gov/surface-water-quality/sop/.</u>

Springs in complex terrain often are shaded by surrounding cliffs and boulders. This limitation of photosynthetically active solar radiation may influence ecosystem structure and function. The potential solar radiation budget of the site will be collected using a Solar Pathfinder<sup>TM</sup>, used according to manufacturer instructions for the latitude of the site, and as documented in Appendix 2. The solar pathfinder dome will be photographed at each site to ensure QC on those data.

#### **B5 Quality Control**

Quality control (QC) activities are technical activities performed on a routine basis to quantify the variability that is inherent to any environmental data measurement activity. The purpose for conducting QC is to understand and incorporate the effects the variability may have in the decision making process. Additionally, the results obtained from the QC analysis, or data quality assessment, may identify areas where variability can be reduced or eliminated in future data collection efforts, thereby improving the overall quality of the project being implemented. Many of the proposed metrics consist of observation data including plant species lists, macroinvertebrates lists, and site geomorphology. To ensure quality control for these observational data, all field crews will have have subject matter experts on each team. For example, each team will include a trained or degreed botanist, a biologist, and physical scientist to eliminate identification errors.

Quantitative data include water flow volume and water quality. Flow measurement is described more thoroughly in B2.1, but the quality control of these measurements is built around using repeated measures and averaging the results. Larger discharge springs are more easily measured with precision instruments like flow meters and these will be used when applicable to reduce some source of bias. Quality control for water quality measurements is achieved through well calibrated and maintained instruments and following established SOPs as described in B4 above.

#### **B5.1 Field Sampling Quality Control**

The quality of the data that are collected will be controlled using standardized methods, as described in Stevens et al. (2016; Appendix 2). Six-replicated flow measurements are recorded and at least one back-up device is taken into the field for field water quality measurements. It improves accuracy to have one technician taking measurements while another records the readings, who then reads the values back. These methods will be demonstrated and tested for utility during the pilot data collection for NMRAM development, and may be refined for this NMRAM. All Technical Team members who collect environmental data must be trained in the use of these protocols and will collect data in accordance with the procedures as they are defined in the draft NMRAM Field Sheets and at the training session.

All applicable water quality instrumentation is calibrated daily, according to manufacturer's recommendations. The calibration log is maintained independently from the field equipment and is checked regularly for equipment maintenance. The log is kept in a central location during the field operation, is returned to the Contractor laboratory for data entry, and is stored in the lab and field equipment cabinets. Each crew carries backup instrumentation in case the primary unit cannot be calibrated or if the unit fails while in the field. Calibration solutions are disposed of after their expiration date, and only fresh calibration solutions are used during field trips.

Several potential metrics lend themselves to observer bias, particularly estimation and measurement of vegetation and substrate cover. Density estimation sheets are useful for training and calibration of field crews, and field crews will be independently and collectively compared during the pilots study task. Results of all crew training and calibration efforts will be documented and provided in quarterly and final reports to SWQB and the advisory committee.

#### **B5.2 Data Entry Quality Control**

Field sheets will be organized, reviewed for completeness and placed in a labeled file folder by the crew leader. The field crew and trained support staff will enter the data into Springs Online by staff other than the individual who filled out the field sheet. The Springs Online interface includes code that flags water quality, vegetation and substrate cover values, and other data values that are out of range to limit data entry error. Should any questions arise, the data entry personnel will add a note to the fieldsheet, along with a color-coded flag for the field crew member who should answer that question. Field crews will then review the sheets and either respond to the questions. Once the question has been addressed, the flag will be removed. When each data point from a page has been addressed, the data entry staff person will sign

and date the fieldsheet. The SSI Program Manager will review all data, using standardized exported reports that identify missing values and outliers. The Contractor Project Manager will supervise all phases of the data entry process.

#### **B6 Instrument/Equipment Testing, Inspection, and Maintenance**

As described previously and in Appendix 2, all instrumentation and equipment is checked before and after field work, tested as needed, and calibrated according to manufacturer's recommendations. An equipment log is kept at the Contractor's office, and is used for instrument check-out, check-in, and problem solving on any particular issues that a piece of equipment sustains in the field.

Any equipment used for testing the Level 2 wetland assessment method will be checked, tested and calibrated according to manufacturer's recommendations. In the event of instrument failure, the deficiency will be logged and the Contractor will correct the problem, rejecting the resultant data or accepting the data with notations. The SWQB WPC will be notified of the decisions made and the corrections to the problem having taken place.

#### **B7 Instrument/Equipment Calibration and Frequency**

A check list of field equipment is included in Appendix 2 and will be included in the draft NMRAM Field Guide for springs of Ecoregion 23 that lists all instruments, equipment, and supplies necessary to complete the data collection effort.

As described previously and Appendix 2, instrumentation and equipment is calibrated each day of field work, according to manufacturer's recommendations to ensure data completeness and reduce data rejections. A calibration log is maintained in the field and returned to the Contractor office following field work, and will be provided to the SWQB. All instruments will be cleaned and inspected for wear in the Contractor laboratory following each field excursion.

#### **B8 Inspection and Acceptance of Supplies and Consumables**

#### **B8.1 Field Sampling Supplies and Consumables**

Contractor field sampling supplies and consumables are checked at the end of every field endeavor by the contractor project managers. Replacement supplies and consumables are purchased as needed and checked before the next field trip. All crew members are expected to be familiar with the equipment and supplies needed for an individual trip. A copy of the checklist is completed during trip planning. An example of the checklist is provided in Appendix 2.

#### **B9 Non-Direct Measurements**

The development of the springs RAM will require little non-direct data acquisition, as most of the data have already been compiled into Springs Online and in state wetlands and riparian maps. However, contract field crews may refer to topographic maps, or GPS basemaps (e.g., Garmin). The crew may use printed maps in the field when GPS devices have poor reception (such as in narrow canyons). Per our protocol, the crew will document the source of information (GPS, map, other), and describe the source on the fieldsheets. The Contractor will assemble public data into

Revision Date: January 28, 2018

map layers of soils, topographic position, aspect, flow rate (if known), land ownership, and other data that may help assess spring condition.

#### **B10 Data Management**

Data obtained for this project are maintained in a relational database and GIS electronic files at NHNM and SWQB. All electronic data will be filed and labeled in a consistent manner. All data will be delivered to the WPC as soon as practical following data collection event. Electronic data are stored on a dedicated SSI server, and are incrementally backed up hourly to a remote location. All data are secured through password protection and are unavailable to unauthorized users, to protect from accidental manipulation. Data at Springs Online is not subject to version control errors. Exported geodatabases that are delivered to the SWQB contain metadata that includes the date of export. Data transmitted to the SWQB and advisory committee are available online to those with security access, and are maintained on CDs, on the SWQB hard drive, and in hard copy form as Wetlands Program files that are maintained by the SWQB Wetlands Program Coordinator.

Contractors will provide summary reports to the SWQB WPC. All data and summary reports will be compiled into the semi-annual and final project report and provided to US EPA Region 6 Wetlands Program.

#### **B10.1 Data Acquisition, Direct Measurements**

All data will be entered into the Springs Online database, immediately following each field trip. Expeditious data entry helps ensure field crew memory of site-specific details, and ability to respond to questions by the project and program managers or the Principal about questionable data. Data are stored in a MySQL database on a secure server, and the Springs Online interface is designed using HTTP, PHP, and Javascript. With technical coding support, the Contractor Program Manager, overseen by the Contractor Principal has designed this database following three principles:

- 1. It should be highly efficient, requiring no more time to enter the data than it did to collect them. Data entry into Springs Online is secure, user-friendly, and intuitive.
- 2. The data entered should be restricted to assure accuracy and consistency, with terminology, scientific names, and responses limited to values in lookup tables, yet have the flexibility to allow for anomalous occurrences.
- 3. Users must be able to easily export meaningful data. A thorough description and user guide for the database is available at <a href="http://springstewardshipinstitute.org/database-manual-1">http://springstewardshipinstitute.org/database-manual-1</a> (Appendix 5).

The Springs Online database has robust reporting functionality, providing preprogrammed reporting capacity for efficient compilation, archival, and presentation of analyses and results. The associated SSI fieldsheets are designed to simplify data entry, with fields organized in the same order as the database. Quality control checks are integrated into the coding to assure veracity of data entry. Access to the data requires a username and password, and specific permissions for read, write, or admin access. Verbatim values are stored in the MySQL database, and an administrative history tracks changes made by users. Data are stored on a server that is protected by a firewall. Each night, code runs automatically to export the database into a geodatabase that includes related tables, lookup tables, and metadata.

#### **C ASSESSMENT AND OVERSIGHT**

#### **C1** Assessment/Oversight and Response Actions

The SWQB WPC provides project oversight by reviewing data collection efforts. The SWQB WPO provides day-to-day oversight during data collection activities including adherence to this QAPP. Any problems encountered during the course of this project will be immediately reported to the SWQB WPC, who will consult with appropriate individuals to determine appropriate action. All problems will be documented for inclusion in the project file, semi-annual and final reports. The SWQB and advisory committee will assess project progress to ensure the QAPP is being implemented, including periodic audits by the QAO, as needed. Those assessments and any problems will be reported by the SWQB WPC to the Quality Assurance Officer.

#### **C2** Reports to Management

Quarterly and final reports will be prepared and reviewed internally by the Contractor, and presented to the SWQB and advisory committee for their review. Any deviations from the specifications in the SWQB Project Workplan and MNA-SSI Intergovernmental Agreement for this project will be documented and reported to WPC. Following inclusion of SWQB review comments, the Contractor will submit finalized reports to the SWQB WPC, who will present those reports to the US EPA Grants Project Officer, to show project accomplishments, data acquisition and entry, and to provide a venue to bring up any issues with the project. The reports will allow the EPA to assess the productivity of the Springs Wetlands NMRAM project and be kept informed on the progress of the project. A report detailing the findings will be provided in the final project report. The field guide and manual will serve as major documentation of the Springs Wetlands NMRAM, and will relate the findings to several different RAMs, covering different wetlands types in New Mexico.

#### **D DATA REVIEW AND USABILITY**

#### D1 Data Review, Verification, and Validation Requirements

Prior to using the data for wetlands protection, policy, or public uses, the quality of the data will be reviewed and evaluated, as described in Sections B10.1 andC1, above, and in Appendix 2. Data are compiled from field sheets, entered in to Springs Online, reviewed and verified by Contractor staff that did not enter those data, and re-verified and validated by Contractor Project Manager. Errors will be corrected where possible, and rejected and reported upon by the Contractor if questions about those data cannot be satisfactorily answered. Additional review, verification, and validation will be completed by the Contractor QA Officer and Program Manager. Standardized and randomized checks of data entry, field calibration of instrumentation, and technician training will be conducted and reported upon by the Contractor, and data error levels above 1% will not be accepted. These data review,

verification, and validation efforts will ensure the Contractor provides high quality springs inventory and assessment data to the State of New Mexico.

#### **D2 Verification and Validation Methods**

Defining the data verification and validation methods helps ensure that project data are evaluated in an objective and consistent manner. For the current project, such methods have been described in Section D1 (above) for information gathered and documented as part of the field sampling and field measurement activities, as well as the data generated by the Contractor's and NMED's laboratories.

#### **D3** Reconciliation with User Requirements

The Contractor, in collaboration with the SWQB and advisory committee, will use the assembled pilot study data to clarify issues related to protocol adequacy, completeness, and efficiency. The data assembled through the larger inventory and assessment will be used to further those analyses, and to address the question of the applicability of the methods to demonstrate the utility of the new Springs Wetlands RAM for southern NM. Critical analyses here will include the adequacy of the methods for identifying individual sites that are exemplary and of use as reference sites, sites at which management attention is warranted, and site at high levels of risk due to anthropogenic impacts. Such analyses will be conducted using ranked, non-parametric statistical analyses, and multivariate analyses of the diverse physical, biological, and anthropogenic impact assessment scoring, as described in the SSI SEAP protocols (Appendix 3; e.g., Springer et al. 2015, Ledbetter et al. 2016). These overview analyses will help clarify the utility of the project to meet the management and policy needs of the State of New Mexico.

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**Appendix 1: Receiving Form** 



New Mexico Environment Department Surface Water Quality Bureau

# Rapid Assessment Method for Springs in Southwestern New Mexico

Quality Assurance Project Plan Acknowledgement Statement

This is to acknowledge that I have received a copy of the **Rapid Assessment Method for Springs in Southwestern New Mexico** Quality Assurance Project Plan.

As indicated by my signature below, I understand and acknowledge that it is my responsibility to **read**, **understand**, **become familiar with and comply** with the information provided in the document to the best of my ability.

Signature		
Name (Please Print)		· · · · · · · · · · · · · · · · · · ·
Date	****	 -

#### **Appendix 2: Springs Inventory Protocol**

Please connect to this link to a copy of the Springs Inventory Protocol. Alternatively the protocol is available online at: <a href="http://docs.springstewardship.org/PDF/ProtocolsBook.pdf">http://docs.springstewardship.org/PDF/ProtocolsBook.pdf</a>.

#### **Appendix 3: Springs Ecosystem Assessment Protocol (SEAP)**

The Springs Ecosystem Assessment Protocol (SEAP) is available online at: <a href="http://springstewardshipinstitute.org/s/SEAPCulturalApril2012.pdf">http://springstewardshipinstitute.org/s/SEAPCulturalApril2012.pdf</a>

#### Appendix 4: Groundwater Dependent Ecosystem (GDE) Protocol

The Groundwater Dependent Ecosystem Protocol is available online at: <a href="https://www.fs.fed.us/geology/GDE">https://www.fs.fed.us/geology/GDE</a> Level I FG final March2012 rev1 printing.pdf

#### **Appendix 5: Springs Online Manual**

This user guide is available at <a href="http://springstewardshipinstitute.org/database-manual-1">http://springstewardshipinstitute.org/database-manual-1</a>. From the Springs Online database, click the question mark symbol to open the user guide for information specific to a page.